

analysis of the stresses induced in the different parts of high speed connecting rods and crank shafts. Finally, Chapters viii. and xii. are devoted to a very concise discussion of frames, hanging chains and arched ribs.

In the preface, the author states that the book is only intended to be a lecture-room treatment of the subject, which to be effective must be supplemented by laboratory and drawing office work. We venture to think that the work usually done in the drawing office is, in many cases, of such a special and routine character that it only serves to illustrate a very few branches of the subject. It is, of course, true that a properly equipped laboratory, such as the one at Cambridge, enables the student to provide himself with examples which illustrate a very considerable portion of the subject, but some teachers of applied mechanics—fortunately few in number—do not possess a laboratory, and even many of those who do find it desirable to still further supplement the work done in it by means of tutorial classes. The complete absence of any numerical examples will be consequently much felt, and the author would considerably increase the value of his books as *class-room* text-books if he would add, at the end of them, a set of judiciously selected numerical examples which would forcibly illustrate the different points raised in the text.

A word of praise should be given to the Cambridge University Press for the excellent manner in which the book is printed and arranged. It is to be hoped that the present book, together with the same author's "Steam Engine," are intended to form the nucleus of a library of text-books dealing with engineering subjects.

S. D.

#### A NEW WORK ON LEAD.

*Metallurgy of Lead and Silver.* Part I. By Henry F. Collins. Pp. xvi + 368. (London: C. Griffin and Co., Ltd., 1899.)

THIS work is one of a series of metallurgical treatises edited by Sir W. C. Roberts-Austen, F.R.S., and written by one of his former pupils, who, besides having gone through a course of training at the Royal College of Science with distinguished success, has had a large amount of practical experience in mines and metallurgical works, which renders him well qualified to successfully undertake the compilation of a work on lead smelting. In these days of great metallurgical enterprises it is of the utmost importance that we should be kept acquainted with the up-to-date methods of our competitors all over the world; and although there are several good books in existence dealing with the metallurgy of lead, the present one is a welcome addition.

The author starts with methods of assaying lead and silver ores, which is a necessary part of the process, and gives valuable information on the method of correct sampling; he also points out those methods of assaying which yield the best results by the wet and dry ways. A very admirable feature of the book is the abundant reference to authority, in which he follows the notable example of his distinguished editor. With the object of economising space, as well as facilitating reference and comparison, details of the practice in particular localities

have been thrown into the form of tabular statements, and these should prove useful for reference.

It is much to be regretted that so many errors have been allowed to remain in the text and referred to in the table of errata, when by a little more care they might have been avoided. The section on alloys of lead is very meagre, and chiefly compiled from the writings of other metallurgists. Such loose statements as "No definite alloys of lead and antimony are known" (p. 24) are entirely misleading, as several varieties of lead-antimony alloys are used for type metal. The properties of lead as used in trade with the various defects experienced in practical work, such as plumbing, would have formed a valuable adjunct, as many persons are interested in lead-working who care little about the smelting of ores.

The chapter on lead ores, although somewhat condensed, contains the chief information required for practical purposes. The greater part of the book is devoted to lead smelting. It is treated in a sufficiently full manner, the information is reliable, and the language explicit. We are sorry to learn that the various forms of mechanical roasters are not more generally applicable, and that the hand-rabbed reverberatories, with the enormous cost of manual labour, are still in extensive use on account of the scarcity of skilled labour in many localities, mechanical furnaces only being adopted in the larger works where the required skill is available. Various kinds of roasting furnaces are carefully described and their merits discussed. The chemical side of the question is admirably dealt with, and greatly adds to the value of the book for scientific readers.

The principles of blast furnace practice here given forms the most prominent and important part of the work, and should be extremely useful to those engaged in the lead-smelting industry. A correct knowledge of the scientific basis of the processes has not been attained in the past by those responsible for some of our works, and possibly this method of treatment may enable some of our closed mines to be reopened and profitably worked. At any rate, we commend the suggestion to those concerned. The author has brought a wide range of knowledge to bear on the subject, and gives useful data for correct blast furnace practice. The nature of fluxes and composition of slags, with their proper chemical formulæ, are here given in considerable detail, and indicate a complete grasp of the subject.

Chapter ix. commences with some recognised methods of analysing ores and slags, so as to enable the operator to properly apportion the constituents of the charge. This is followed by instructions as to the method of calculating the charge, which is somewhat complicated in large works, dealing with a variety of complex ores. Chapter x. deals with blast furnace products, and as these may consist of lead speiss, regulus, slag and secondary products, which have to be separately dealt with, it will be seen how important their consideration to the lead smelter must be. It also contains a considerable number of analyses of mattes, speisses and slags very valuable for purposes of reference.

The subject of flue-dust, its composition, collection and treatment, is discussed in a clear and instructive manner. The difficulties met with in smelting mixed ores of lead and zinc, and the various processes, dry and

wet, proposed from time to time by different authorities, are here discussed, and indicate how much more scientific most metallurgical processes are becoming.

The last part of the book deals with the highly important subject of desilverisation, and is written in no way inferior to the preceding pages. Altogether the author has succeeded in producing a trustworthy and fairly comprehensive treatise on the metallurgy of lead, and we trust his enterprise may be rewarded by a deservedly large sale.

#### OUR BOOK SHELF.

*Zur Stereochemie des fünfwerthigen Stickstoffes mit besonderer Berücksichtigung des asymmetrischen Stickstoffes in der aromatischen Reihe.* By Edgar Wedekind. Pp. 126. (Leipzig: Veit, 1899.)

ALTHOUGH nearly fifty years have passed since Hofmann succeeded in preparing methylethylamylphenylammonium chloride—a compound in which the nitrogen atom is directly united with five different groups or atoms—very little progress has been made with the study of the stereochemistry of pentavalent nitrogen. It is true, no doubt, that the first and the most important step in advance was made nearly nine years ago by Le Bel, who succeeded in preparing an optically active liquid from a solution of methylethylpropylisobutylammonium chloride, but until quite recently, when Pope accomplished the resolution into its optically active isomerides of Wedekind's benzylphenylallylmethylammonium iodide, Le Bel's work afforded the only evidence which we had of optical activity due to pentavalent nitrogen. The number of known compounds which contain such an asymmetric nitrogen atom, and which might possibly be resolved into optically active components, was also comparatively limited.

In these circumstances it might seem a little premature to write a book on the stereochemistry of pentavalent nitrogen, since the facts to be dealt with are few in number, and the theories which have been advanced to explain them—although nearly as numerous as the facts themselves—still require a groundwork of experimental confirmation.

This difficulty of the lack of material no doubt forced itself upon the author, whose book is not merely an historical review of our present knowledge of the stereochemistry of pentavalent nitrogen; this portion of his subject is, in fact, disposed of within the limits of the first seventeen pages, and by far the largest part (ninety-five pages) of the book consists of an account of the work which the author himself has published during the current year in the *Berichte*; the remaining thirteen pages are devoted to a discussion of the theoretical conclusions to be drawn from the results of his experiments.

As the discussion or criticism of the author's investigations—interesting and important though they are—is a task which does not lie within the scope of this review, little remains to be said except that the whole book is written in much the same way as if it were a paper intended for publication in Liebig's *Annalen*; consequently it contains a great many experimental details, including even the results of many analyses, and this rather detracts from its value as a literary effort. Those, however, who take a particular interest in the stereochemistry of pentavalent nitrogen will certainly welcome the book, and principally on account of its historical survey and theoretical conclusions, for here they will find the scattered literature of the subject conveniently collected and discussed in the light of the author's own important observations. F. S. K.

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*Handbook of Metallurgy.* By Dr. Carl Schnabel. Translated by Henry Louis. Two vols. Vol. i. Pp. xvi + 871; Vol. ii. Pp. xiv + 732; 927 Figures in the text. (London: Macmillan and Co., Ltd. 1898.)

BERGRATH DR. CARL SCHNABEL is professor of metallurgy and chemical technology at the Royal Academy of Mines at Clausthal, and his work has long enjoyed a well-deserved reputation. Prof. Henry Louis, who translates it, points out that it is a curious fact that there does not exist in the English language a single complete treatise on metallurgy. Dr. Percy's treatises remain only splendid fragments. Dr. C. Schnabel's object has been to give a complete account of the metallurgical treatment of all the metals ordinarily employed, together with all the recent improvements in the art. The two volumes before us are, however, incomplete, as neither they nor the original work deal with the vast section of metallurgy which includes iron and steel.

Prof. Louis modestly says that his chief object has been to present a faithful interpretation of the original. In this he has admirably succeeded. With the full consent of Dr. Schnabel, the translator has introduced brief rules of any new processes, or improvements on old ones, that have been brought out since the German original was produced. It is a pity, therefore, that the additions made by Prof. Louis are not distinguishable from the rest of the text. In a compressed work of this kind space is, of course, valuable; but it appears to have been in more than one case unequally allotted. The Augustin process, for instance, is now but little used, and is, in fact, nearly obsolete, but it has ten pages devoted to it, while the cyanide process for the extraction of gold from "tailings," which is now the most important wet process in the whole range of metallurgy, has only thirteen pages. The wet process for extracting copper, which does admit of brief statement, has no less than forty-nine pages. Many of the illustrations, from their freshness and originality, will be a great boon to students. In a second edition it would be well to devote more care to the illustrations; at present, though they give a good general idea of the processes or machines they illustrate, they are seldom drawn to scale. The writer of this notice has found general diagrammatic schemes of processes to be of great value to students, and some might well have been introduced into the present work. The sections devoted to the metallurgy of zinc and of aluminium may be mentioned as, considering the size of the volume, being singularly complete and conscientious. Viewed as a whole, the book is very accurate and trustworthy, and in welcoming this addition to metallurgical literature Prof. Louis is to be congratulated on the translation.

W. C. ROBERTS-AUSTEN.

*La Philosophie Naturelle.* By Dr. W. Nicati. Pp. xi + 308. (Paris: Giard and Brière, 1900.)

DR. NICATI has, it seems, published books on medicine, on physiology proper, and on psychology. A sense of incompleteness has led him at last to make a raid upon philosophy.

An uncompromisingly positive mind, which does its own thinking *en amateur*, is rarely uninteresting. And Dr. Nicati has ideas upon Rabelais and Zola, upon art and politics in general, on immortality and evolution, on the ultimate formulæ for matter and life. His criticisms and his political discourses with a socialist leaning are often readable and sometimes suggestive. A reduction of the idea of responsibility to causation does not lack ingenuity. Unfortunately, any further worth in the book it is impossible to discover, save as it reveals the writer's very abnormal psychosis. "Architectonic" faculty united with incoherence, naivety mostly